(14) NEPRF-CP-Note-101

ENVPREDRSCHFAC COMPUTER PROGRAMMING NOTE 10
JULY 1973

(6) (12)

OCEAN CLIMATOLOGY EXTRACTION AND ADJUSTMENT PROGRAM FOR THE MEDITERRANEAN

PROGRAM SOVEL

(10) Jul 73

(12) 24 p.

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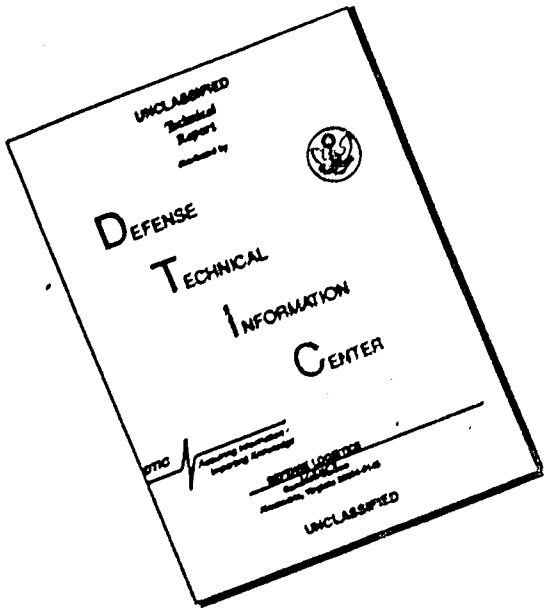

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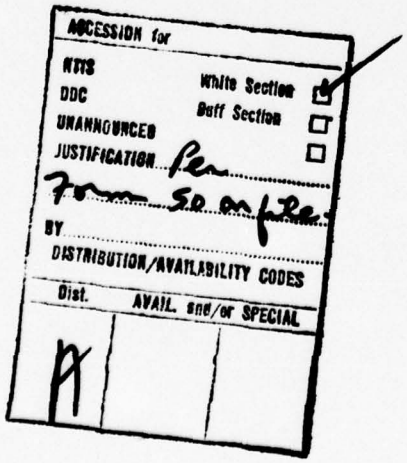

I. INTRODUCTION

SOVEL was written as part of the Ocean Thermal Structure Analysis package for Fleet Weather Central, Rota, Spain. Its primary purpose is to extract the temperature and salinity levels (by one-degree squares) in desired locations from an ocean climatology tape. It takes the corresponding analyzed sea-surface temperature and the mixed layer depth at given locations which are read from input cards and adjusts the upper standard levels to these parameters. An additional feature of the program is the adjustment of the temperature and salinity gradients below the mixed layer depth. These gradients can be sharp indeed in the Mediterranean. Their sharpness varies with various parameters and seasons and this variation has been taken directly into consideration with this program.

The program outputs are (a) the interpolated ocean (salinity and temperature) climatology (optional); (b) the tabulated adjusted ocean climatology (salinity and temperature) and sound speed (Figure 1); and (c) graphical printing of the above parameters (Figure 2).

The subroutines MEDCLM and INTRP were written by Mr. Roger Bauer and the climatology tape was also prepared by him. The program will run on any CDC computer (CDC 1604, 3100, 6500, etc.) with FORTRAN IV or FORTRAN Extended compiler.

DATE 12 15

LAT. 40.0N LONG. 6.0E

DEPTH	TEMP.	SALIN.	VELOC.
1	15.90	37.67	1513.50
30	15.90	37.67	1513.98
60	15.90	37.67	1514.47
80	15.90	37.67	1514.80
91	15.43	37.71	1513.59
103	14.96	37.76	1512.35
125	14.02	38.09	1510.13
150	13.38	38.17	1508.55
200	13.06	38.27	1508.44
250	13.07	38.36	1509.41
300	13.12	38.42	1510.47
400	13.17	38.46	1512.34
500	13.14	38.45	1513.88
600	13.07	38.45	1515.30
700	13.01	38.43	1516.73
800	12.96	38.43	1518.22
900	12.95	38.42	1519.84
1000	12.94	38.42	1521.46
1200	12.94	38.40	1524.77
1500	12.96	38.40	1529.85

Figure 1. Example of tabular printout of salinity, temperature and sound speed profile.

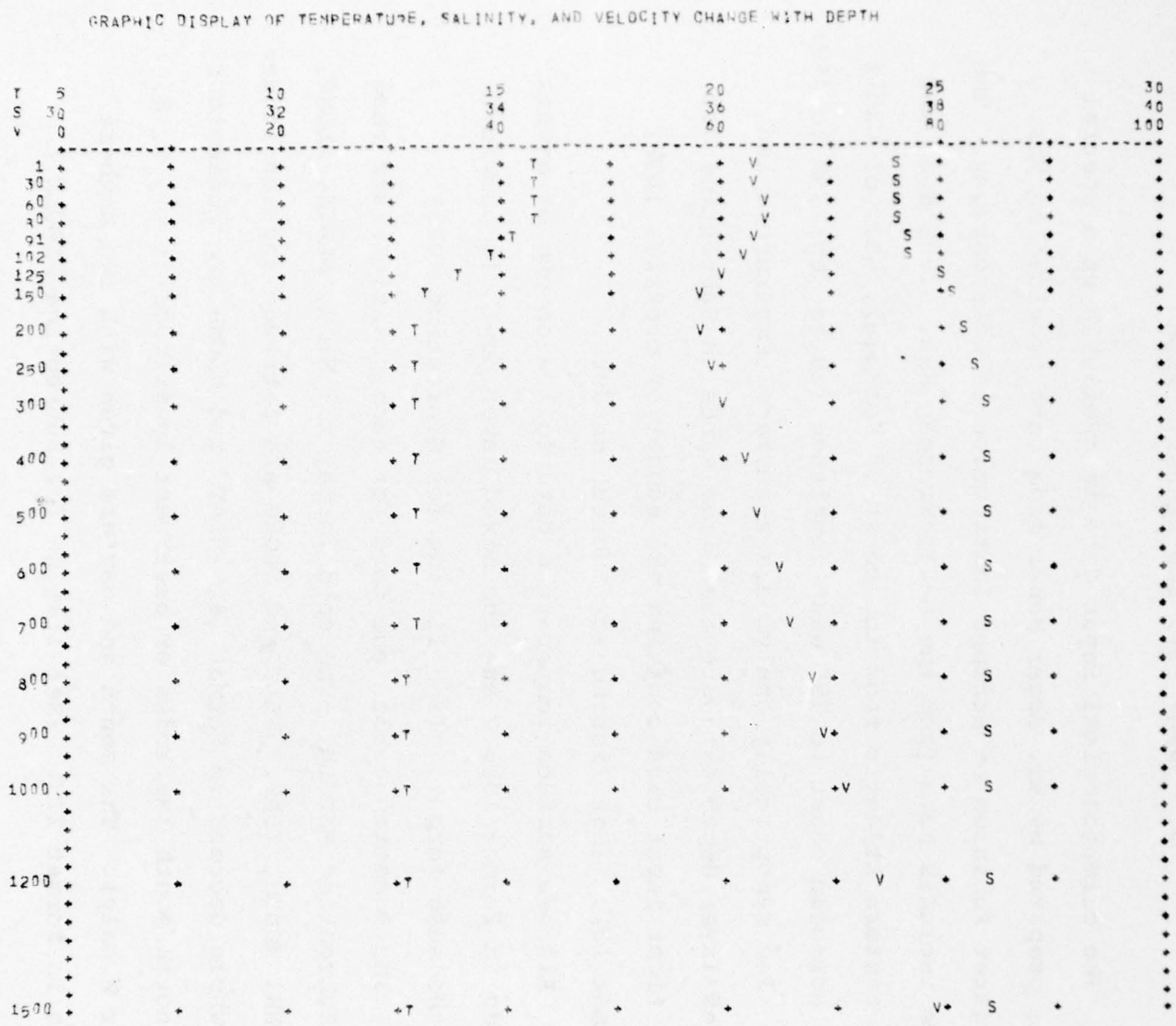

Figure 2. Example of graphical printing of a temperature, salinity and sound speed profile.

2. INPUT DATA AND REQUEST CARDS

The climatological input data is available on a special tape prepared by Mr. Roger Bauer from data provided by Mrs. Margaret Robinson of Scripps Institution of Oceanography. The tape includes data from the Mediterranean Sea, Black Sea, and the eastern Atlantic from the coast of Portugal, Gulf of Cadiz and Moroccan coast to 15° west longitude (20 to 50N; 15W to 45E).

The synoptically analyzed sea-surface temperature and mixed layer depth data are read from cards in Subroutine J02. The first input card contains the number of profiles (LOP, Format I3). (See listing for Subroutine J02.)

All sea-surface temperature data follow on one or several cards in Format 10F6.2 and the mixed layer depth is provided in the same format. (See listing for Subroutine J02.)

The location cards (one card for each position) are read in Subroutine MEDCLM. The card format is: NLAT, NLATH, NLONG, NLONH, MONTH, IDAY. NLAT and NLONG are latitude and longitudes in whole degrees in Format I4. NLATH and NLONH are indicators of north/south latitudes or east/west longitudes (i.e., N, S, E or W only). The month and day are given with two numbers each in Format 2I2. (See listing for Subroutine MEDCLM.)

3. LIST OF ESSENTIAL ABBREVIATIONS IN THE PROGRAM

ALAT	Latitude of the profile
ALONG	Longitude of the desired profile
DEDE	Depth in kilometers
DEP	Depth of the levels in meters
DEPTH	Depth of a given level in upper layers (above 150 m)
DEPTH2	Depth of a given level in lower layers
EDP	An additional depth counter in sorting of the values of a profile
ICNT	A counter for records per page
KE	A counter for the number of levels in a profile
LINE	Number of characters in a line in printing a program
LLM	A counter
LO	A counter for the number of profiles under computation
LOP	The number of profiles requested by the program
ND	The number of values for lower layers for which annual mean values of salinity and temperature are available
NLATH	Indicator for north or south latitude
NLONH	Indicator east or west of longitude
NNN	A counter

NS	The number of levels in upper layers
NUM	A counter
PLD	Mixed layer depth in meters
SAL	Salinity in 0/00
SALTD	Salinity at a given level in lower layers
SALTS	Salinity at a given level in upper layers
SDEP	An intermediate storage for depth values
SSAL	An intermediate storage for salinity values
SST	Sea surface temperature in degree Celcius
STEMP	An intermediate storage for temperature values
TEMP	Temperature in degrees Celcius
TEMPD	Temperature at a given level in lower layers
TEMPS	Temperature at a given level in upper layers
VEL	Sound velocity meters per second
VOS	An intermediate computation of sound speed
VOP	
VOT	
VSI	

4. SUMMARY OF ROUTINES BY FUNCTION

SOVEL — This is a control program which sets the counters LO (the number of profiles) and KE (the number of levels in any given profile). It calls several subroutines and checks at the end that all desired profiles have been computed.

JO2 — This subroutine reads from the cards the number of profiles required in the particular computation, and the sea-surface temperature and the mixed layer depth for each profile. Calls Subroutine MEDCLM.

JO3 — This subroutine computes the sound speed for each level in each profile. The latest version of the sound speed computation formula from SACLANT (NATO) ASW Research Center, La Spezia, Italy is used.[1]

JO4 — This subroutine first prints, in tabular form, the month, day, latitude, longtude and the depth, temperature, salinity and sound speed for each profile. Thereafter, the values are graphically printed out for checking and eventual subjective correction. (See Figures 1 and 2)

---

[1] Leroy, C. C. Development of simple equations for accurate and more realistic calculation of the speed of sound in sea water. SACLANT ASW Res. Centr. Technical Report 128, 1968.

SOR	This subroutine sorts the various levels in the profile after additional levels have been inserted below the mixed layer depth by Subroutine GRAD
GRAD	This subroutine adjusts the temperature and salinity gradients below the mixed layer depth and adds additional levels, if so required.
MEDCLM	This subroutine extracts climatological data from a special ocean climatology tape. The tape is sorted from north to south and west to east. Data to be printed is selected on the basis of a request card (locations on the card must be in the same order as the tape). The coordinate system used in sorting the tape is as follows: Longitudes are sorted starting with 0° east and ending with 0° west. Latitudes are sorted with all data from a given latitude appearing before any data from the next southern latitude.

5. LISTINGS OF PROGRAMS AND SUBROUTINES

Listings for each of the programs and subroutines are presented in the same order in which they are summarized in section 4.

PROGRAM SOVEL

```
                                3200 FORTRAN (3,0)/RTS          05/25/73

      PROGRAM SOVEL
      DIMENSION TEMP(23),DEP(23),SAL(23),VEL(23),SST(25),PLD(25),EDP(25,
     16),LINE(110),SDEP(32),STEMP(32),SSAL(32),NNN(25)
      COMMON TEMP,DEP,SAL,VEL,SST,PLD,EDP,LINE,SDEP,STEMP,SSAL,NNN,NUM,L
     1OP,LT,LO,VO,KE,KEP,NUC,NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
      LO=1                                                              8
      KE=1                                                              9
    3 CALL J02
      CALL GRAD
      CALL SOR                    CONTROL PROGRAM
      CALL J03
      CALL J04
      LO=LO+1
      IF (LOP-LO)5,3,3                                                 18
    5 STOP                                                             20
      END
```

SUBROUTINE J02

```
                                        3200 FORTRAN (3.0)/RTS          05/25/73

      SUBROUTINE J02                                                              21
      DIMENSION TEMP(23),DEP(23),SAL(23),VEL(23),SST(25),PLD(25),EDP(25,
     16),LINE(110),SDEP(32),STEMP(32),SSAL(32),NNN(25)
      COMMON TEMP,DEP,SAL,VEL,SST,PLD,EDP,LINE,SDEP,STEMP,SSAL,NNN,NUM,L
     1OP,LT,LO,VO,KE,KEP,NUC,NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
C J02 READING OF VALUES                                                           26
C     MAX 20 PROFILES, 27 DEPTHS EACH,
C     NUM IS NUMBER OF DEPTHS IN THE PROFILE
C     LOP IS NUMBER OF PROFILES
C     POC IS PROFILE NAME
C     DEP DEPTH IN METERS
C     TEMP IS TEMPERATURE IN DEGREES C
C     SAL IS SALINITY IN PROFILE
C     ALAT IS LATITUDE OF THE PROFILE
C     LTS IS TEMP. SCALE IN PLOTTING
C     LTS =10 THEN 0 TO 10 DEG.  IF LTS=4 THEN 0 TO 25 DEG.
C     SST IS IN CENTIGRADE
C     PLD IS THE MIXED LAYER DEPTH IN METERS
   21 FORMAT(I3)
   23 FORMAT(10F6.2)
      IF(LO-1)40,40,28
   40 VO=1.E92.9
      READ 21, LOP                    )
      READ 23,(SST(I),I=1,LOP)        ) Reading the number of profiles
      READ 23,(PLD(I),I=1,LOP)        ) and SST and MLD for these
   28 CONTINUE                          profiles.
      CALL MEDCLM  <-------------- Calling subroutine for extraction
      RETURN                       of climatology from tape.
      END
```

SUBROUTINE J03

```
                                    3200 FORTRAN (3.0)/RTS          05/25/73

      SUBROUTINE J03                                                          50
      DIMENSION TEMP(23),DEP(23),SAL(23),VEL(23),SST(25),PLD(25),EDP(25,
     16),LINE(110),SDEP(32),STEMP(32),SSAL(32),NNN(25)
      COMMON TEMP,DEP,SAL,VEL,SST,PLD,EDP,LINE,SDEP,STEMP,SSAL,NNN,NUM,L
     1OP,LT,LO,VO,KE,KEP,NUC,NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
C J03 COMPUTATION                                                             55
      ALAT = FLOATF((NLAT-5)/10)          COMPUTATION OF
      DO 30 I=KE,KEP                        SOUND SPEED                     56
      IF(DEP(I)-1.)500,500,501
  500 DEP(I) = 1.
  501 DEDE   =DEP(I)/1000.
      VOT    =3*(TEMP(I)-10.)-0.006*(ABSF(TEMP(I)-10.)**2)-0.04*(ABSF(
     1TEMP(I)-18.)**2)+1.2*(SAL(I)-35.)-0.01*((TEMP(I)-18.)*(SAL(I)-35.)
     2)+DEP(I)/61.
      VOP=0.1*ABSF(DEDE)**2+(0.0002*ABSF(DEDE)**2)*(ABSF(TEMP(I)-18.)
     1**2)+(0.1*DEDE*ALAT)/90.
      VOS    =2.0E-7*TEMP(I)*(ABSF(TEMP(I)-10.)**4)
      VSI    =0.0015*(ABSF(SAL(I)-35.)**2)*(1-DEDE    )
   30 VEL(I)=VO+VOT    +VOP    +VOS    +VSI
      RETURN                                                              68
      END                                                                 69
```

SUBROUTINE J04

3200 FORTRAN (3.0)/RTS 05/25/73

```
      SUBROUTINE J04                                                    70
      INTEGER XFIXF
      DIMENSION TEMP(23),DEP(25),SAL(23),VEL(23),SST(25),PLD(25),EDP(25,
     16),LINE(110),SDEP(32),STEMP(32),SSAL(32),NNN(25)
      COMMON TEMP,DEP,SAL,VEL,SST,PLD,EDP,LINE,SDEP,STEMP,SSAL,NNN,NUM,L
     1OP,LT,LO,VO,KE,KEP,NUC,NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
      ALAT = FLOATF((NLAT-5)/10)
      ALONG = FLOATF((NLONG-5)/10)
C F04 PRINTING OF VALUES                                                75
   42 FORMAT (25X,5HDEPTH,6X,5HTEMP,,6X,6HSALIN,,6X,6HVELOC,/)          78
   43 FORMAT (25X,F5.0,6X,F5.2,6X,F5.2,6X,F7.2)                         79
  251 FORMAT(25X,4HLAT,,F7.1,A2,4X,5HLONG,,F7.1,A2,/)
  253 FORMAT(1H1,25X,4HDATE,  I6,  4X,I6,///)
      KKE=KE
      PRINT 253, MONTH, IDAY                                            Printing of
      PRINT 251, ALAT, NLATH, ALONG, NLONH                              D, T, S, V in
      PRINT 42                                                          tabular      83
      PRINT 43,(DEP(I),TEMP(I),SAL(I),VEL(I),I=KE,KEP)                 form         84
C     GRAPHING OF VALUES
   50 FORMAT (1H1,20X,75H GRAPHIC DISPLAY OF TEMPERATURE, SALINITY, AND
     1VELOCITY CHANGE WITH DEPTH      , ///)
  261 FORMAT(15X,1HT,3X,1H5,18X,2H10,18X,2H15,18X,2H20,18X,2H25,18X,2H30
     1)
   52 FORMAT(15X,1HS,2X,2H30,18X,2H32,18X,2H34,18X,2H36,18X,2H38,18X,
     12H40)
   53 FORMAT(15X,1HV,3X,1H0,18X,2H20,18X,2H40,18X,2H60,18X,2H80,17X,
     13H100)
      PRINT 50
      PRINT 261
      PRINT 52
      PRINT  53
      IT=1HT
      IS=1HS
      IV=1HV
      IX=1HX
      IY=1HY
      IBLANK=1H
      IP=1H+
      IM=1H-
      IZ=1HZ
      DO 64 I=1,100
   64 LINE(I)=IM
      DO 66 I=10,100,10
   66 LINE(I)=IP
      PRINT 113,(LINE(I),I=1,100)                                       Graphing of
  113 FORMAT(19X,1H+,100A1)                                             D, T, S, V
      DO 68 I=1,99                                                      by printer
   68 LINE(I)=IBLANK
   71 I=KE
      IF(DEP(I)-150.)75,75,72
   72 DEUI=DEP(I)-DEP(I-1)
      IF(DEP(I)-1500.)730,730,720
  720 KL=XFIXF(DEUI/100.)
      GO TO 740
  730 KL=XFIXF(DEUI/50.)
  740 KAK=1
   73 PRINT 200,(LINE(L),L=1,99)
  200 FORMAT(19X,1H+,99A1,1H+)
      IF(KAK-KL)74,75,75
   74 KAK=KAK+1
```

SUBROUTINE J04 (continued)

```
      GO TO 73
C     TEMPERATURE
   75 DO 210  L=10,100,10
  210 LINE(L)=IP
      J=XFIXF(TEMP(I)*4.)-20
      IF(J)82,82,83
   82 J=1
   83 IF(J-100)85,84,84
   84 J=99
   85 LINE(J)=IT
C     SALINITY
      M=XFIXF(SAL(I)*10.-300)
      IF(M)92,92,93
   92 M=1
   93 IF(M-100)95,94,94
   94 M=99
   95 IF(M-J)97,96,97
   96 LINE(M)=IX
      GO TO 100
   97 LINE(M)=IS
C     VELOCITY
  100 JJ=XFIXF(VEL(I)-1450)
      IF(JJ)102,102,103
  102 JJ=1
  103 IF(JJ-100)105,104,104
  104 JJ=99
  105 IF(JJ-M)108,106,108
  106 LINE(JJ)=IY
      GO TO 110
  108 LINE(JJ)=IV
  110 IF(J-JJ)114,112,114
  112 LINE(J)=IZ
      IF(DEP(I))400,400,114
  400 DEP(I)=1.
  114 IDEP=XFIXF(DEP(I))
      PRINT 310,IDEP,(LINE(I),I=1,99)
  310 FORMAT(10X,I8,1X,1H+,99A1,1H+)
      DO 333 I=1,99
  333 LINE(I)=IBLANK
      KE=KE+1
      IF(KE-KEP)71,71,345
  345 KE=KKE
      RETURN
      END
```

Graphing by printer

SUBROUTINE SOR

3200 FORTRAN (3.0)/RTS 05/25/73

```
      SUBROUTINE SOR
      DIMENSION TEMP(23),DEP(23),SAL(23),VEL(23),SST(25),PLD(25),EDP(25,
     1),LINE(110),SDEP(32),STEMP(32),SSAL(32),NNN(25)
      COMMON TEMP,DEP,SAL,VEL,SST,PLD,EDP,LINE,SDEP,STEMP,SSAL,NNN,NUM,L
     1OP,LT,LO,VO,KE,KEP,NUC,NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
      LU=0
      IF(EDP(LO,2)-100.)3,4,4
    4 NNN(LO)=NUM+2
      GO TO 8                                   SORTING OF T, S VALUES IN
    3 IF(EDP(LO,5))5,5,6                        CORRECT DEPTH SEQUENCE
    5 NNN(LO)=NUM+3
      GO TO 8
    6 IF(NUC-1)17,16,17
   16 NNN(LO)=NUM+3
      GO TO 8
   17 NNN(LO)=NUM+4
    8 KKE=KE
      NMN=KKE+NNN(LO)-1
      KEP=NMN
      LLM=NNN(LO)
      DO 105 I=1,LLM
      IF(I-1)11,11,12
   11 SDEP(I)=0.1
      STEMP(I)=SST(LO)
      KE=KE+1
      GO TO 105
   12 IF(LU-1)14,40,13
   13 IF(LU-3)40,70,40
   14 IF(DEP(KE)-PLD(LO)) 15,21,20
   15 IF(DEP(KE+1)-PLD(LO))24,23,22
   20 SSAL(I-1)=SAL(KE-1)
      SDEP(I)=PLD(LO)
      STEMP(I)=SST(LO)
      SSAL(I)=SAL(KE-1)
      LU=1
      GO TO 105
   21 SSAL(I-1)=(SAL(KE-1)+SAL(KE))/2.
      SSAL(I)=SSAL(I-1)
      SDEP(I)=PLD(LO)
      STEMP(I)=SST(LO)
      LU=1
      KE=KE+1
      GO TO 105
   22 SSAL(I-1)=(SAL(KE-1)+SAL(KE))/2.
      SSAL(I)=SSAL(I-1)
      STEMP(I)=SST(LO)
      SDEP(I)=DEP(I)
      SDEP(I+1)=PLD(LO)
      STEMP(I+1)=STEMP(I)
      SSAL(I+1)=SSAL(I)
      KE=KE+1
      I=I+1
      LU=1
      GO TO 105
   23 SSAL(I-1)=(SAL(KE-1)+SAL(KE)+SAL(KE+1))/3.
      SSAL(I)=SSAL(I-1)
      SSAL(I+1)=SSAL(I)
      STEMP(I)=SST(LO)
      STEMP(I+1)=SST(LO)
      SDEP(I)=DEP(KE)
```

SUBROUTINE SOR (continued)

```
      SDEP(I+1)=PLD(LO)
      I=I+1
      KE=KE+2
      LU=1
      GO TO 105
   24 SSAL(I-1)=(SAL(KE-1)+SAL(KE)+SAL(KE+1))/3.
      SSAL(I)=SSAL(I-1)
      SSAL(I+1)=SSAL(I)
      STEMP(I)=SST(LO)
      STEMP(I+1)=SST(LO)
      STEMP(I+2)=SST(LO)
      SSAL(I+2)=SSAL(I)
      SDEP(I)=DEP(KE)
      SDEP(I+1)=DEP(KE+1)
      SDEP(I+2)=PLD(LO)
      IF(DEP(KE+2)-PLD(LO))28,26,25
   25 KE=KE+2
      GO TO 27
   26 KE=KE+3
   27 I=I+2
      LU=1
      GO TO 105
   28 SDEP(I+2)=DEP(KE+2)
      STEMP(I+3)=SST(LO)
      SSAL(I+3)=SSAL(I)
      SDEP(I+3)=PLD(LO)
      IF(DEP(KE+3)-PLD(LO))32,30,29
   29 KE=KE+3
      GO TO 31
   30 KE=KE+4
   31 I=I+3
      LU=1
      GO TO 105
   32 SSAL(I-1)=(SAL(KE-1)+SAL(KE)+SAL(KE+1)+SAL(KE+2)+SAL(KE+3))/5.
      SSAL(I)=SSAL(I+1)
      SSAL(I+1)=SSAL(I)
      SSAL(I+2)=SSAL(I)
      SSAL(I+3)=SSAL(I)
      SSAL(I+4)=SSAL(I)
      STEMP(I+4)=SST(LO)
      SDEP(I+3)=DEP(KE+3)
      IF(DEP(KE+4)-PLD(LO))36,34,33
   33 SDEP(I+4)=PLD(LO)
      KE=KE+4
      GO TO 35
   34 SDEP(I+4)=DEP(KE+4)
      KE=KE+5
   35 I=I+4
      LU=1
      GO TO 105
   36 SDEP(I+4)=DEP(KE+4)
      SSAL(I+5)=SSAL(I+4)
      STEMP(I+5)=SST(LO)
      IF(PLD(LO)-200.)362,361,361
  361 PLD(LO)=200.
  362 SDEP(I+5)=PLD(LO)
      IF(DEP(KE+5)-PLD(LO))38,38,37
   37 KE=KE+5
      GO TO 39
   38 KE=KE+6
   39 I=I+5
      LU=1
```

SUBROUTINE SOR (continued)

```
      GO TO 105
   40 IF(EDP(LO,1))70,70,41
   41 IF(EDP(LO,2)-100.)42,44,44
   42 IF(EDP(LO,5))43,43,45
   43 SDEP(I)=EDP(LO,1)
      SDEP(I+1)=EDP(LO,3)
      STEMP(I)=EDP(LO,2)
      STEMP(I+1)=EDP(LO,4)
      SDI=(SSAL(I-1)-SAL(KE))/3.
      SSAL(I)=SSAL(I-1)-SDI
      SSAL(I+1)=SSAL(I-1)-2.*SDI
      I=I+1
      LU=3
      GO TO 105
   44 SDEP(I)=EDP(LO,1)
      SDEP(I+1)=EDP(LO,3)
      SDEP(I+2)=EDP(LO,5)
      STEMP(I)=EDP(LO,2)-100.
      STEMP(I+1)=EDP(LO,4)
      STEMP(I+2)=EDP(LO,6)
      SDI=(SSAL(I-1)-SAL(KE))/4.
      SSAL(I)=SSAL(I-1)-SDI
      SSAL(I+1)=SSAL(I-1)-2.*SDI
      SSAL(I+2)=SSAL(I-1)-3.*SDI
      I=I+1
      KE=KE+1
      LU=3
      GO TO 105
   45 SDEP(I)=EDP(LO,1)
      SDEP(I+1)=EDP(LO,3)
      SDEP(I+2)=EDP(LO,5)
      STEMP(I)=EDP(LO,2)
      STEMP(I+1)=EDP(LO,4)
      STEMP(I+2)=EDP(LO,6)
          SDI=(SSAL(I-1)-SAL(KE))/4.
      SSAL(I)=SSAL(I-1)-SDI
      SSAL(I+1)=SSAL(I-1)-2.*SDI
      SSAL(I+2)=SSAL(I-1)-3.*SDI
      I=I+2
      LU=3
      GO TO 105
   70 SDEP(I)=DEP(KE)
      IF(STEMP(I-1)+0.05*TEMP(KE))310,311,311
  310 STEMP(I)=STEMP(I-1)+0.05
      GO TO 312
  311 STEMP(I)=TEMP(KE)
  312 IF(SSAL(I-1)-0.25-SAL(KE))314,314,313
  313 IF(I-2)314,314,401
  401 IF(KE+2-LLM)402,402,314
  402 SSAL(I)=(SSAL(I-2)+SAL(KE+2))/2.
      GO TO 315
  314 SSAL(I)=SAL(KE)
  315 KE=KE+1
  105 CONTINUE
      KE=KKE
      L=1
      DO 201 I=KE,LMN
      TEMP(I)=STEMP(L)
      DEP(I)=SDEP(L)
      SAL(I)=SSAL(L)
      L=L+1
  201 CONTINUE
      RETURN
      END
```

SUBROUTINE GRAD

3200 FORTRAN (3.[illegible]/RTS [illegible]5/25/73

ADJUSTMENT OF GRADIENTS
BELOW THERMOCLINE

```
      SUBROUTINE GRAD
      DIMENSION TEMP(23),DEP(23),SAL(23),VEL(23),SST(25),PLD(25),EDP(25,
     16),LINE(110),SDEP(32),STEMP(32),SSAL(32),NNV(25)
      COMMON TEMP,DEP,SAL,VEL,SST,PLD,EDP,LINE,SDEP,STEMP,SSAL,NIN,N[illegible],L
     1OP,LT,L[illegible],V[illegible],KE,KEP,NUC,NLAT,NLATH,[illegible]LONG,NLONH,MONTH,IDAY
      J=LJ
      NUC=0
      DO 115 I=KE,KEP
      IF(DEP(I)-PLD(J))3,40,115
   40 NUC=1
    3 IF(DEP(I+1)-PLD(J))115,41,4
   41 NUC=1
    4 IF(DEP(I)+20.-PLD(J))6,6,5
    5 IF(DEP(I)+10.-PLD(J))35,25,25
C     BETWEEN LEVEL BELOW AND MLD SMALL DISTANCE
    6 IF(PLD(J)-90.)7,8,8
    7 IF(SST(J)-18.)8,8,9
    8 DIF=(SST(LJ)-TEMP(I+2))/4.
      IF(DIF+0.1)80,80,81
   80 IF(SAL(I-1)-SAL(I))83,82,82
   82 DIF=0.
      GO TO 81
   83 DIF=-0.08
   81 DDF=(DEP(I+2)-PLD(J))/4.
      EDP(J,1)=PLD(J)+DDF
      EDP(J,3)=PLD(J)+2.*DDF
      EDP(J,5)=PLD(J)+3.*DDF
      EDP(J,2)=SST(J)-DIF+100.
      EDP(J,4)=SST(J)-2.*DIF
      EDP(J,6)=SST(J)-3.*DIF
      GO TO 115
    9 DIF=(SST(J)-TEMP(I+2))/4.
      IF(DIF+0.1)90,90,91
   90 IF(SAL(I-1)-SAL(I))93,92,92
   92 DIF=0.
      GO TO 91
   93 DIF=-0.08
   91 DDF=(DEP(I+2)-PLD(J))/4.
      EDP(J,1)=PLD(J)+DDF
      EDP(J,3)=PLD(J)+2.*DDF
      EDP(J,5)=PLD(J)+3.*DDF
      IF(DIF)120,120,121
  120 DIF=0.
      GO TO 11
  121 IF(DIF-4.)10,10,11
   10 EDP(J,2)=SST(J)-2.+100.
      EDP(J,4)=SST(J)-2.-DIF
      EDP(J,6)=SST(J)-2.-2.*DIF
      GO TO 115
   11 EDP(J,2)=SST(J)-DIF+100.
      EDP(J,4)=SST(J)-2.*DIF
      EDP(J,6)=SST(J)-3.*DIF
      GO TO 115
C     BETWEEN LEVEL ABOVE AND MLD SMALL DISTANCE.
   25 IF(PLD(J)-90.)28,26,26
   26 IF(SST(J)-18.)27,27,28
   27 DDF=(DEP(I+1)-PLD(J))/4.
      EDP(J,1)=PLD(J)+DDF
      EDP(J,3)=PLD(J)+2.*DDF
      EDP(J,5)=PLD(J)+3.*DDF
```

SUBROUTINE GRAD (continued)

```
      DIF=(SST(J)-TEMP(I+1))/4.
      IF(DIF+0.1)270,270,271
  270 IF(SAL(I-1)-SAL(I))273,272,272
  272 DIF=0.
      GO TO 271
  273 DIF=-0.08
  271 EDP(J,2)=SST(J)-DIF-0.25*DIF
      EDP(J,4)=EDP(J,2)-DIF-0.1*DIF
      EDP(J,6)=EDP(J,4)-0.8*DIF
      GO TO 115
   28 DDF=(DEP(I+1)-PLD(J))/4.
      EDP(J,1)=PLD(J)+DDF
      EDP(J,3)=PLD(J)+2.*DDF
      EDP(J,5)=PLD(J)+3.*DDF
      DIF=(SST(J)-TEMP(I+1))/4.
      IF(DIF+0.1)280,280,281
  280 IF(SAL(I-1)-SAL(I))283,282,282
  282 DIF=0.
      GO TO 281
  283 DIF=-0.08
  281 EDP(J,2)=SST(J)-DIF-0.3*DIF
      EDP(J,4)=EDP(J,2)-DIF-0.1*DIF
      EDP(J,6)=EDP(J,4)-0.7*DIF
      GO TO 115
C     MLD APPROX. BETWEEN TWO LEVELS.
   35 DDF=(DEP(I+1)-PLD(J))/3.
      EDP(J,1)=PLD(J)+DDF
      EDP(J,3)=PLD(J)+2.*DDF
      EDP(J,5)=0.
      DIF=(SST(J)-TEMP(I+1))/3
      EDP(J,2)=SST(J)-DIF-0.3*DIF
      EDP(J,4)=EDP(J,2)-DIF
  115 CONTINUE
      RETURN
      END
```

SUBROUTINE MEDCLM

3200 FORTRAN (3.0)/RTS 05/25/73

```
      SUBROUTINE MEDCLM
C     PROGRAM MEDCLM RETIEVES CLIMATOLOGY DATA FROM TAPE,
C     TAPE IS SORTED NORTH TO SOUTH, WEST TO EAST,
C     DATA TO BE PRINTED IS SELECTED ON BASIS OF REQUEST CARD,
C     REQUEST CARDS MUST BE IN SAME ORDER AS TAPE,
C
C     THE COORDINATE SYSTEM USED IN SORTING THE TAPE IS AS FOLLOWS
C     LONGITUDES ARE SORTED WEST TO EAST STARTING WITH 0E AND ENDING WITH 0W
C     LATITUDES ARE SORTED NORTH TO SOUTH  WITH ALL DATA FOR A LATITUDE
C     APPEARING BEFORE ANY DATA FOR THE NEXT MORE SOUTHERN LATITUDE
C
      DIMENSION TEMP(23),DEP(23),SAL(23),VEL(23),SST(25),PLD(25),EDP(25,
     16),LINE(110),SDEP(32),STEMP(32),SSAL(32),NNN(25)
      COMMON TEMP,DEP,SAL,VEL,SST,PLD,EDP,LINE,SDEP,STEMP,SSAL,NNN,NUM,L
     1OP,LT,LO,VO,KE,KEP,NUC,NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
      DIMENSION DEPTH(6),TEMPS(12,6),SALTS(6)
      DIMENSION DEPH2(17),TEMPD(17),SALTD(17)
C
C     INITIALIZE COUNTERS
C     ICNT IS COUNTER FOR RECORDS PER PAGE,
C     NLAT,NLATH ARE THE REQUESTED LATITUDE DESIGNATORS,
C     SET LOGICAL UNITS FOR I/O, IR=CARD READER, IT=TAPE UNIT,
      JLAT=JLONG=0  $  IT=1
C     READ A REQUEST CARD
      READ 1000,NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
 1000 FORMAT(I4,A1,I4,A1,2I2)
C     CHECK FOR THE LAST CARD
      IF(NLATH.EQ.1H ) STOP
C     CHECK LATITUDE AND LONGITUDE
      MLAT=NLAT
      IF(NLATH.EQ.1HN)21,22
   21 MLAT=-MLAT
   22 MLAT=900+MLAT
      MLONG=NLONG $ IF(NLONH.EQ.1HW)23,25
   23 MLONG=3600-MLONG
   25 IF(MLAT-JLAT)40,30,50
   30 IF(MLONG-JLONG)40,100,50
C     CARD OUR OF SEQUENCE PRINT ERROR MESSAGE, READ NEXT CARD,
   40 PRINT 1001, NLAT,NLATH,NLONG,NLONH,MONTH,IDAY
 1001 FORMAT(22H CARD OUT OF SEQUENCE,3X,I4,A1,I4,A1,2I2)
      RETURN
C     READ NEW TAPE RECORD, AND CHECK AGAINST REQUEST CARD
C
   50 READ(IT,1002)LAT,LATH,LONG,LONH,NS,ND ,
     1(DEPTH(I),(TEMPS(J,I),J=1,12),SALTS(I),I=1,NS),
     2(DEPH2(I),TEMPD(I),SALTD(I),I=1,ND)
 1002 FORMAT(2(I4,A1),2I5/6(F8.2,13F6.2,2X/),17(F8.2,2F6.1,/))
      BACKSPACE IT
      NUM = NS + ND
      KEP = NUM
C
C     CHECK TAPE RECORD LAT AND LONG,
      JLAT = LAT $ IF(LATH.EQ.1HN)51,52
   51 JLAT=-JLAT
   52 JLAT=900+JLAT
      JLONG = LONG
      IF(LONH.EQ.1HW)55,25
   55 JLONG=3600-JLONG       $ GO TO 25
C     NEED TAPE STATUS CHECK ON ABOVE TAPE I/O,
C
```

SUBROUTINE MEDCLM (continued)

```
C     HAVE PROPER TAPE RECORD, WHICH PRINT REQUEST
  100 CALL INTRP(MONTH,IDAY,TEMPS,TEMPD,NS,ND,TEMP)
      DO 400 I=1,NS
      DEP(I)=DEPTH(I)
  400 SAL(I)=SALTS(I)
      IF(NS.GE.6)GO TO 411
      NS = NS +1
      DO 410 I=NS,23
  410 DEP(I)=SAL(I)=TEMP(I)=-0.
      RETURN
  411 NDC=ND+6
      DO 500 I=7, NDC
      DEP(I)=DEPH2(I-6)
  500 SAL(I)=SALTD(I-6)
      NDC=NDC+1
      DO 510 I= NDC,23
  510 DEP(I)=SAL(I)=TEMP(I)=-0.
      RETURN
      END
```

SUBROUTINE INTRP

```
                                        3200 FORTRAN (3.0)/RTS          05/25/73

      SUBROUTINE INTRP(MONTH,IDAY,TEMPS,TEMPD,NS,ND,T)
      DIMENSION TEMPD(17),TEMPS(12,6),T(23),A(5),B(5),DAMTH(12)
     1,CO(12,5),SI(12,5)
      DATA(DAMTH=31.,28.,31.,30.,31.,30.,31.,31.,30.,31.,30.,31.),
     1(RAD30=.5233987755  ), (CO(1)=0. )
C     COMPUTE CONSTANTS USED IN HARMONIC ANALYSIS
      IF(CO(1).NE.0.) 150,90
   90 DO 100 I=1,12      & DO 100 K=1,5
      ANG=FLOATF(I-1)*RAD30*FLOATF(K)
      CO(I,K)=COSF(ANG)
  100 SI(I,K)=SINF(ANG)
C     FIND ANGLE IN ANNUAL CYCLE FOR THE GIVEN DAY
  150 ANG=((FLOATF(IDAY-15)+DAMTH(MONTH))/DAMTH(MONTH)+FLOATF(MONTH))*
     1RAD30
C     COMPUTE THE 12 HARMONIC TERMS AND THEN FIND THE TEMP ON THE GIVEN DAY
      DO 400 J=1,NS
      A0=A6=0.
      DO 160 K=1,5
      A(K)=B(K)=0.
      DO 160 I=1,12
      A(K)=A(K)+TEMPS(I,J)*CO(I,K)
  160 B(K)=B(K)+TEMPS(I,J)*SI(I,K)
      DO 200 I=1,12
      A0=A0+TEMPS(I,J)
      IF(I/2*2.EQ.I)170,180
  170 A6=A6-TEMPS(I,J)
      GO TO 200
  180 A6=A6+TEMPS(I,J)
  200 CONTINUE
      T(J)=(A0+A6*COSF(ANG*6)) /12.
      DO 240 I=1,5
      AN=ANG*FLOATF(I)
  240 T(J)=T(J)+(A(I)*COSF(AN)+B(I)*SINF(AN))/6.
      IF(J.EQ.1)400,241
  241 IF(T(J).GT.T(J-1))245,400
  245 M=MONTH
      IF(IDAY.GT.15)260,250
  250 M=M-1
      IF(M.GT.0)260,255
  255 M=12
  260 IF(TEMPS(M,J).GT.TEMPS(M,J-1))400,270
  270 M=M+1
      IF(M.LT.12)278,275
  275 M=1
  278 IF(TEMPS(M,J).GT.TEMPS(M,J-1))400,280
  280 T(J)=T(J-1)
  400 CONTINUE
      DO 420 I=1,ND
  420 T(I+6)=TEMPD(I)
      DO 500 I=1,ND
      IF(T(I+6).GT.T(6))450,510
  450 T(I+6)=T(6)
C     CHANGED I TO I+6 IN 420, 420+2, 450
  500 CONTINUE
  510 RETURN
      END
```